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OPERATING AND MAINTENANCE MANUAL

DU MONT
TYPE 264-B
VOLTAGE CALIBRATOR

ALLEN B. DU MONT LABORATORIES, INC.
INSTRUMENT DIVISION
CLIFTON, NEW JERSEY

Obviously, the design of any scientific instrument results from a series of compromises which represent the designer's opinion of an ideal instrument consistent with contemporary engineering techniques and present-day production possibilities.

In developing this instrument, an attempt has been made to incorporate those characteristics which, we believe, will satisfy the greatest number of applications.

We feel, however, that the real test of any instrument is the opinion of the man who uses it. This day-to-day test of the instrument's advantages and limitations will prove, more than any other method, just what characteristics are desirable.

Because of the nature of the equipment manufactured by Allen B. Du Mont Laboratories, Inc., it is only by complete cooperation between the customer and our Engineering Department that satisfactory designs can be achieved. In a continuous attempt to increase the applicability of our equipment to the problems of the engineer, we sincerely request suggestions advising in what manner the design of this equipment may be further extended to include these problems.

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MANUAL

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GENERAL DESCRIPTION

PURPOSE

The Du Mont Type 264-B Voltage Calibrator is a small, convenient, low-priced voltage calibrator for use with any commercial cathode-ray oscillograph. It provides a convenient method for measuring the peak-to-peak voltage of any signal viewed on a cathode-ray oscillograph.

DESCRIPTION

The Type 264-B Voltage Calibrator as illustrated in Figure 1 is housed in a small metal cabinet and is designed to be mounted conveniently on top of any commercial cathode-ray oscillograph. The front panel is clearly marked to describe the function of all controls. Once connected to the cathode-ray oscillograph and mounted thereon, the input terminals of the Calibrator become the input terminals for the oscillograph, and no changes in connection will be necessary for most applications.

This instrument furnishes an output voltage that is essentially a square wave, the amplitude of which is continuously variable from .01 to 100 volts. This amplitude may be adjusted by means of a linear potentiometer to match the amplitude of the signal under observation. A direct-reading, calibrated dial on the output potentiometer is divided into 100 divisions, with that portion of the dial between 0 and 10 not subdivided in order to avoid inaccurate use. Connected in parallel with the output potentiometer is a conventional, four-step, decade, output attenuator that provides four-ranges of potential for the output potentiometer, namely: .01 to 0.1 volt, 0.1 to 1.0 volt, 1.0 to 10.0 volts, and 10 to 100 volts. The accuracy of the output voltage is within ±5% of full scale on each range.

The Type 264-B Voltage Calibrator operates from either a 115 or a 230 volts, 50/60 cycle line source. See CAUTION tag attached to the instrument.

Figure 1—The Du Mont Type 264-B Voltage Calibrator.

SPECIFICATIONS

Ranges: .01 to 0.1 volt;
0.1 to 1.0 volt;
1.0 to 10.0 volts;
10.0 to 100.0 volts.

Accuracy: ± 5% of full scale on each range, including line voltage variations of ± 15%.

Input Impedence: 20 $\mu\mu$f (when signal is connected through the calibrator).

Power Source: 115/230 v rms, 50/60 cps, 20 watts.

Fuse Protection: ½ ampere for 115 volt operation.
¼ ampere for 230 volt operation.

Size: 4½″ h., 8″ w., 5¾″ d.; 5 lbs.

THEORY OF OPERATION

PRINCIPLES

The circuit consists of a power supply which furnishes equal positive and negative bias voltages to a dual-diode. One diode is connected to clip the positive half-cycle of the sine-wave output of the power transformer, and the other diode clips the negative half-cycle at the proper voltage to result in exactly 100 volts peak-to-peak at the output terminals. A miniature voltage-regulator tube maintains the proper bias on the two diodes. The output voltage is a clipped sine-wave with essentially flat tops.

CIRCUIT DESCRIPTION

The power supply of the Type 264-B Voltage Calibrator consists of a full-wave rectifier, V103, and a RC capacitor-input filter consisting of C101A, C101B, R102, R103, and R104, with V102, a voltage regulator, connected across the output. A negative voltage is picked off a resistor that is inserted between the center tap of the power transformer and ground. The output of the power supply is taken between this negative voltage and the positive voltage, and the two filter capacitors C101A and C101B serve to filter both voltages. Although the difference in potential between the two output-leads of the power supply is 150 volts, one of these leads is +75 volts with respect to ground and the other is −75 volts with respect to ground.

V101 is a dual-diode, one-half of which is a positive rectifier and the other half a negative rectifier. The plate and cathode, Pins 2 and 5, respectively, compose the positive rectifier, and the plate and cathode, Pins 7 and 1, respectively, compose the negative rectifier.

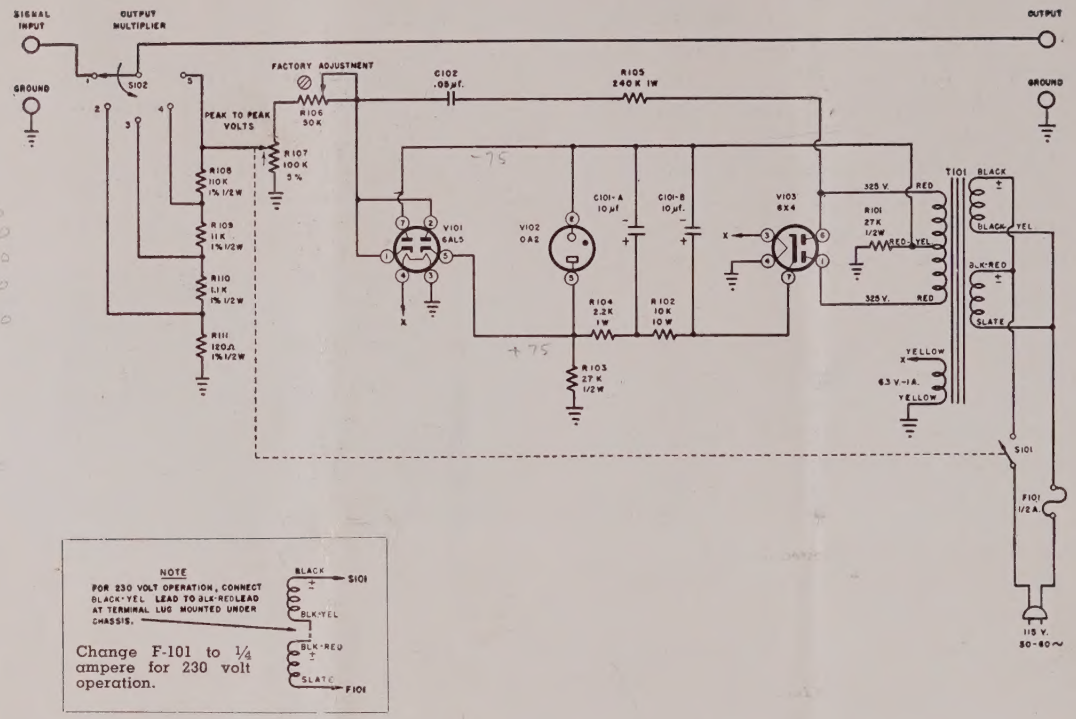

Figure 2—Schematic of Circuit (98000021-4, Issue 2).

Pin 5 is maintained at a potential of +75 volts. Pin 7 is maintained at a potential of −75 volts. Approximately 325 RMS volts from the power transformer are connected through R105 and C102 to Pins 1 and 2 of V101 as well as to the output of the calibrator. The action of the dual-diode, biased in this manner, clips the positive half-cycle of the output voltage at 75 peak volts and the negative half-cycle at 75 peak-volts, resulting in an output voltage of 150 volts peak-to-peak.

Then, the output voltage is adjusted to a maximum of 100 volts by the factory adjustment, a variation resistor R106. The full output voltage is obtained at position 5 of the OUTPUT MULTIPLIER switch S102, with the tap on R107 being at the end of the resistor furthest from ground. Attenuation of the output voltage is accomplished with the continuous output attenuator R107, and the four steps of the decade attenuator obtained with resistors R108, R109, R110, and R111.

OPERATION

The Type 264-B Voltage Calibrator operates from a 115-volt or a 230-volt 50-60 cycle line. A CAUTION TAG is attached to this instrument. This tag indicates the line voltage with which the instrument should be used. To convert to the alternate operating voltage, refer to the last paragraph in this book and to Figure 2.

The normal procedure is to connect the signal under study to the input terminals of the Type 264-B. The output terminals of the Type 264-B are then connected to the input of the oscillograph. A fifth position of the OUTPUT MULTIPLIER switch connects the signal to the output terminals of the voltage calibrator and thus to the input terminals of the oscillograph. Then, by throwing the attenuator switch, either the unknown signal or any one of four ranges of calibrating voltage may be applied to the input of the oscillograph. Binding post connections need **NOT** be changed to apply either the signal or calibration voltage to the input of the cathode-ray oscillograph.

OPERATING PROCEDURE

Step 1. Connect the signal to be observed to the input terminals of the Type 264-B Voltage Calibrator and connect the output terminals of this instrument to the vertical input terminals of the cathode-ray oscillograph.

Step 2. Turn the OUTPUT MULTIPLIER switch to the SIGNAL OUTPUT position and adjust the

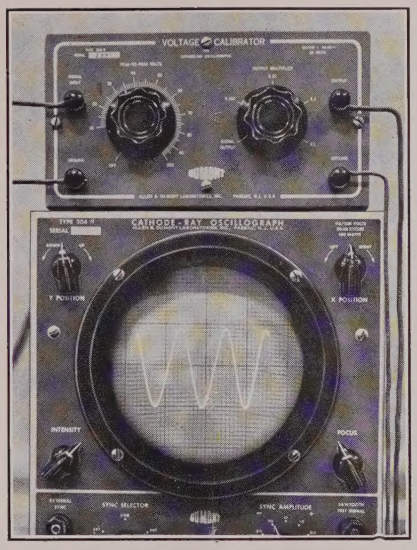

Figure 3—Signal voltage is passed through the Voltage Calibrator to the Vertical Input of the Cathode-Ray Oscillograph. The signal voltage appears on the screen.

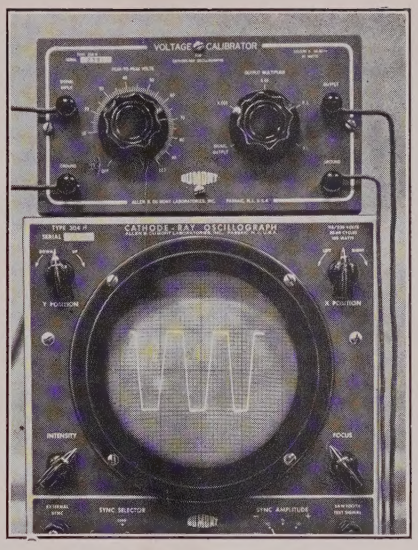

Figure 4—Same as Figure 3, except that the OUTPUT MULTIPLIER switch has been turned to the X.01 Position resulting in the calibration voltage appearing on the screen.

gain control of the oscillograph to produce a pattern of convenient size on the screen of the cathode-ray tube.

Step 3. With the calibrated scale measure the peak-to-peak deflection produced by the signal on the screen.

Step 4. Turn the OUTPUT MULTIPLIER switch on the Type 264-B to the proper range. (The proper range is the one which enables the vernier control to be set as near the high end as possible.)

Step 5. Without changing the setting of the vertical gain control of the oscillograph, adjust the calibrated output dial (PEAK-TO-PEAK VOLTS) of the Type 264-B to result in the same peak-to-peak amplitude of the calibrating voltage as that produced by the signal.

Step 6. Read the calibrated dial and multiply by the decimal multiplier to obtain the peak-to-peak signal voltage.

Figures 3 and 4 show the Type 264-B Voltage Calibrator in use with a cathode-ray oscillograph. In Figure 3, the signal voltage appears on the screen of the cathode-ray tube. Note that the OUTPUT MULTIPLIER switch is at the SIGNAL OUTPUT position. In Figure 4, the OUTPUT MULTIPLIER switch has been turned to the X.01 position and the calibrating voltage appears on the screen. Note that the amplitude of the calibrating voltage has been set to be the same as that of the signal voltage. The voltage in this case is 0.57 volt.

MAINTENANCE

The components used in this instrument have been selected and tested to provide long, trouble-free operating life. It must be recognized, however, that trouble may be expected at some time during the life of the instrument. This section is included to provide useful information for the location and correction of such trouble.

SCHEMATIC OF CIRCUIT

The schematic of the circuit, Figure 2, gives sufficient servicing information to enable this simple equipment to be serviced rather quickly. The component parts are described by symbol designation, value, and tolerance on the schematic. Wherever it is significant, voltage measurements are also given.

WARRANTY

All instruments manufactured by Allen B. Du Mont Laboratories, Inc., are sold under the Du Mont Warranty. For the terms and conditions of the Du Mont Warranty, see the Warranty and Service Notice on the inside back cover.

SERVICE

The Instrument Division maintains complete facilities for servicing Du Mont equipment. For details on the Instrument Service policies, see inside back cover.

Figure 5—Rear view of Voltage Calibrator; case removed.

WARNING

POTENTIALS AS HIGH AS 350 VOLTS ARE FOUND IN THIS INSTRUMENT. AS A RESULT, PROPER CAUTION SHOULD BE EXERCISED WHEN SERVICING THIS EQUIPMENT.

CALIBRATION PROCEDURE

In cases where the voltage regulator tube V102 must be replaced, it is necessary to recalibrate the output voltage.

Step 1. Connect a good vacuum tube voltmeter (which reads peak-to-peak voltage) to the output terminals.

Step 2. Set the calibrated dial on the Type 264-B to 100. Set the OUTPUT MULTIPLIER switch to the X1 position.

Step 3. Loosen the potentiometer lock, adjust the calibration potentiometer R106, so that the vacuum tube voltmeter reads 100 volts peak-to-peak. Tighten the potentiometer lock to maintain calibration against any mechanical vibration of the unit.

CONVERSION FROM ONE OPERATING VOLTAGE TO ANOTHER

For conversion from 115-volt operation to 230-volt operation, unsolder the Black-Red wire from switch S101 on the front panel. Pull this wire through the eyelet on the chassis. Then unsolder the Black-Yellow wire from the fuse holder. Fasten both of these wires to the dummy lug, and solder. Use a ¼ ampere fuse.

For conversion from 230-volt to 115-volt operation, unsolder the abovementioned two wires from the dummy lug. Connect the Black-Yellow wire to the Slate wire at the fuse holder and solder the two together. Thread the Black-Red wire through the eyelet, fasten this wire to the Black wire of the transformer at switch S101, and solder together. Use a ½ ampere fuse.

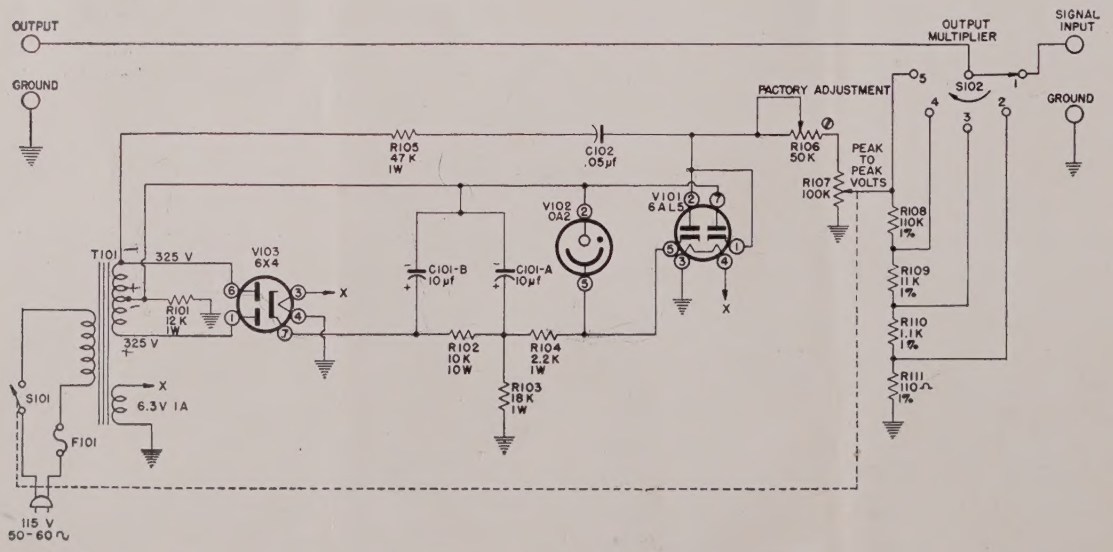

Figure 6—Schematic of Du Mont Type 264-A Voltage Calibrator. In order that this may be used to service the Type 264-A Voltage Calibrator, the schematic of this instrument is shown above.

PATENT NOTICE

Manufactured under one or more of the following U. S. Patents:

1,844,117	1,960,333	1,999,407	2,000,014	2,014,106
2,067,382	2,082,327	2,085,576	2,087,280	2,098,231
2,153,800	2,157,749	2,162,009	2,163,256	2,164,176
2,185,705	2,186,634	2,186,635	2,190,020	RE. 21,326
2,201,309	2,207,048	2,208,254	2,209,507	2,221,398
2,225,099	2,227,822	2,229,556	2,245,409	2,245,428
2,249,942	2,249,943	2,269,115	2,269,129	2,280,700
2,280,738	2,290,592	2,297,742	2,297,752	2,299,471
2,299,510	2,315,848	2,319,691	2,321,149	2,328,259
2,331,401	2,337,980	2,338,336	2,338,646	2,343,630
2,345,549	2,346,509	2,347,933	2,355,363	2,356,733
2,364,687	2,365,476	2,372,455	2,372,901	2,373,114
2,379,488	2,384,931	2,389,025	2,391,082	2,391,090
2,391,273	DES. 143,796	2,396,014	2,398,535	2,398,959
2,404,185	2,408,193	2,409,419	2,410,920	2,414,319
2,414,634	2,419,118	2,419,177	2,423,362	2,426,419
2,429,824	2,435,564	2,435,680	2,436,265	2,437,173
2,438,668	2,438,706	2,438,717	2,439,186	2,440,597
2,441,334	2,442,138	2,442,264	2,442,545	

Other Patents Pending

ALLEN B. DU MONT LABORATORIES, INC.

CLIFTON, N. J., U. S. A.

WARRANTY AND SERVICE NOTICE

for

Industrial Type Cathode-ray Tubes and Instruments

DU MONT INSTRUMENTS

Each instrument manufactured by the Instrument Division of Allen B. Du Mont Laboratories, Inc., is guaranteed to equal or exceed its published performance specifications. It is further guaranteed against defective materials (other than the cathode-ray tube) and workmanship for a period of one year from date of delivery. Any defective instrument or an instrument that does not meet or exceed our specifications will, upon inspection by us, be repaired or replaced at our discretion should such defect appear within the guarantee period.

To register this guarantee, the enclosed guarantee card must be properly filled out and mailed to the factory immediately upon receipt of the equipment. Complete information is necessary. BOTH THE TYPE NUMBER AND THE SERIAL NUMBER OF THE INSTRUMENT MUST BE GIVEN ON THIS CARD.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

DU MONT CATHODE-RAY TUBES

Industrial type cathode-ray tubes manufactured by Allen B. Du Mont Laboratories, Inc., are guaranteed for 1000 hours of operation or for a six-month period of installation, whichever shall first expire. The right is reserved, however, to limit claims to a period of nine months after shipment from the factory. Adjustments will be made on the merit of each individual claim because of the widely varying applications to which such tubes are subjected, and a tube which becomes defective during the guarantee period will be replaced ONLY AFTER INSPECTION AT THE FACTORY. Cathode-ray tubes which are sent in under the guarantee, must be sent with transportation paid.

BURNED OUT HEATERS AND BROKEN GLASS ARE NOT COVERED BY THE TUBE GUARANTEE

To register a tube guarantee, the guarantee card enclosed with the tube must be properly filled out and mailed to the factory immediately upon receipt of the equipment. Complete information is necessary. TYPE NUMBER AND SERIAL NUMBER OF THE CATHODE-RAY TUBE MUST BE INCLUDED. The serial number of the tube will be found either on the glass stem of the electron-gun structure or on the bulb near the Du Mont brand. Tubes must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time and to furnish merchandise in accordance with current specifications without incurring any liability to modify equipment previously sold, or to supply new equipment in accordance with earlier specifications excepting under the classification of special apparatus.

SERVICE

In order to insure factory service under our guarantees, the guarantee cards enclosed with all instruments and tubes must be properly filled out and returned. In all cases where service or adjustment is requested, please write first to the factory giving complete information concerning the nature of the failure and describing the manner in which the equipment was used when failure occurred. THE TYPE NUMBER AND SERIAL NUMBER of the equipment must also be given. In this way, much time can be saved and unnecessary inconvenience often avoided. When writing in this respect, address:

Allen B. Du Mont Laboratories, Inc.
Instrument Service Department
1000 Main Avenue, Clifton, New Jersey

The Instrument Service Department will then send to the customer, the written procedure for sending the instrument back to the factory. All equipment should be packed and shipped in accordance with this procedure; and identification tags should be attached to each tube or instrument.

REPLACEMENT PARTS

If it is necessary to order a replacement component from the factory, always give the type number and serial number of the instrument and refer to the component by its symbol designation and description on the circuit schematic. This will help to expedite service.

Additional copies of this manual may be secured at a cost of one dollar each or ten dollars per dozen copies; postpaid in the United States of America only.